DOCUMENT RESUME

ED 177 473 CS 004 979

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TITLE Early Decoding and Encoding Strategies.
PUB DATE Mar 78
NOTE 17p.; Paper presented at the Annual Meeting of the Eastern Educational Research Association (Williamsburg, VA, March 8-11, 1978)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Beginning Reading; Decoding (Reading); Elementary Education; *Phonics; Reading Improvement; *Reading Instruction; *Reading Research; *Reading Skills; *Sight Method
IDENTIFIERS *Reading Strategies

ABSTRACT

A combination of case study observation and mini-experimentation techniques were used to examine a number of issues of relevance in the study of the acquisition of beginning reading skills. Six children were divided equally among three instructional modes: phonics, whole word, and mixed. They were asked to decode and encode words, and their abilities to assimilate content, process information, and transfer their knowledge to new situations was tested. Each child showed considerable improvement in both decoding and encoding over the six-month period of the study although the rate of improvement varied as did the relative accuracy on the two tasks. The children were consistently more accurate with consonants than they were with vowels, context did not enhance reading for all the children, and individual differences in strategy occurred even between children in the same instructional mode. (TJ)

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Early Decoding and Encoding Strategies

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Paper presented at the meeting of the Eastern Educational Research Association, March 8-11, 1978

CS004979

Early Decoding and Encoding Strategies

The 1976-1977 phase of the Early Decoding and Encoding Strategies Project employed a combination of naturalistic case-study observation and mini-experimentation techniques, to examine a number of issues of relevance in the study of the acquisition of beginning reading skills. The intention was to map in detail the processes by which children who had had no prior exposure to formal reading instruction develop generalization strategies in decoding and encoding.[1]

We assumed that the ability to read is not based simply on a rote memory process but, rather, requires that the beginning reader develop a strategy or method which leads to partial or complete success when dealing with new material.

The model employed in this study is most similar to what Richek (1977-78) has referred to as an "inferred strategy approach", although to some extent task analysis was involved. Our interest was not to see what forms of instructional modalities produced greater accuracy on generalization tasks, but to study the processes involved in the evolution of strategies.

We did not make any firm hypotheses about the nature of the strategies that might evolve, or about the processes by which these might come about. However, in anticipation of a possibly non-continuous movement towards complete accuracy, we were prepared to track changes in these strategies,

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This research was supported by a grant from the Initial Teaching Alphabet Foundation to Miriam L. Goldberg.

[1]The term "decoding" is used here to refer to what is colloquially called "reading"; for our purposes it is specifically defined as the attention to graphic stimuli in order to extract meaning. "Encoding" refers to "writing" words and syllables (by the assembly of preformed letters). This operational definition of encoding eliminated the complicating factor of fine motor dexterity which is needed in letter formation.

such as the modification of some, or the discarding of others. Thus, accuracy was not considered to be the sole barometer of strategy development: analysis of error patterns also served to indicate both the limitations of partial strategies, as well as to point out any systematic errors due to, for example, articulatory or visual stimulus similarities.

We employed both observational and experimental procedures in the study. The observational method, which involves little deliberate experimental intervention, allows for the careful mapping of spontaneously emitted behaviors. Often, the origins of such behaviors offered by a child are not easily understood, and give rise to a number of different hypotheses and possible interpretations. To test out these ideas we supplemented the observations with a variety of mini-experiments; these were constructed for use either with a single child or with all the children. The use of experimental manipulations thus facilitated the elicitation and testing of selected aspects of behavior under more controlled conditions.

The curriculum developed was based on the same letter-sound correspondences in each of three instructional modes. The use of the Initial Teaching Alphabet (i/t/a) made this possible, as it allowed us to include a greater range of words than would have the use of traditional English orthography (t.o.). The order of presentation of the materials was held constant, although the children were permitted to proceed at their own paces.

Three instructional modes were employed: a Phonics, a Whole-Word and a Mixed-Method (which utilized elements of the other two). In the Phonics approach, children were taught the phonemic equivalents of individual graphemes, and were then asked to decode or encode words containing

these phono-graphemes. In the Whole-Word approach, children were taught a series of sight words composed of the same letter-sound correspondences which had been taught to children in the Phonics method; thus, it was possible to use the same test words in both instructional modes. The Whole-Word children received no assistance in identifying letter-sound correspondences; neither did they receive any encouragement to "sound-out" and blend decoding words, or to segment encoding words. While the Mixed-Method children worked with the same letters as did children in the other methods, half of the letters were taught by a phonetic approach, and half by a whole-word approach. These children were permitted to use whichever information they preferred.

Two children were assigned to each instructional mode. They had been selected on the basis of a test we developed to screen for reading readiness (Goldberg, Osborn, & Hebard, 1976; Lawrence, Goldberg, Osborn, & Hebard, 1977). We met with each of the children individually for a minimum of thirty half-hour sessions, spread out over six months. The testing occurred nearly every session with each of the children. The testing procedures were constructed as generalization tasks where the child was to use "known" information (either letter-sound correspondences, or whole-word configurations) in new contexts. Such a procedure taps both the assimilation of content and/or process information, as well as the child's ability to transfer this knowledge to new situations. These generalization tasks were of two primary forms: one in which procedures were common across all children, and one in which procedures were individually-tailored decoding and encoding tasks constructed for a particular child.

The common generalization tasks usually involved the presentation of a word (or words) which had not been taught or previously presented to the

children. All the component information had, however, been made available either explicitly (as phonemes in the Phonics mode) or implicitly (within the context of sight words in the Whole-Word mode). Both encoding and decoding words were included as these two tasks may demand somewhat different strategies which develop in different ways, possibly complementing each other in the process. The children were not informed of the correct responses after erroneous attempts. However, they were often told whether they had been accurate in order to avoid giving them positive reinforcement for incorrect attempts.

An example of a common generalization task is as follows. After the Phonics children had been taught the phonemic equivalents of the letters a, s, m, p and t, and the Whole-Word children had been taught the sight words "sam" and "pat," they were all asked to decode or encode the test words "pam" and "sat".

The individual generalization tasks involved the presentation of material to a particular child; this enabled us to test ideas and hypotheses about the child's strategies which had been generated during discussion and analysis of the child's performance. These tasks, unlike the common generalization tasks, varied greatly from child to child. One example should suffice to illustrate this point. One child's (KM) responses to the standard generalization decoding words led to the hypothesis that she was not attending to non-initial vowels. A number of words were generated so we could examine her performance more explicitly. The list included both bigrams and trigrams of several configurations and the child's responses to each type were compared with the others.

In the analyses, both accuracy and error patterns were examined over time. The time periods were determined by one of two kinds of divisions:

ones in which periods corresponded to the introduction of new material, and ones in which periods were marked by the emergence of individual strategies on the part of an individual child. Each child for whom detailed analyses were conducted showed considerable improvement in both decdoing and encoding over the six-month period, although the rate of improvement varied, as did the relative accuracy on the two tasks. (Due to unforeseen difficulties, the data from three of the children was incomplete.)

With one of the children in the Phonics mode, A., it was clear early on that knowledge of sound-symbol correspondences and segmentation-blending skills were available to her. Initially, she appeared to be more accurate in her encoding than she was in her decoding. Her most common error responses in both tasks were characterized either by inaccuracy on the final consonant (of CVC trigrams) or by the use of an incorrect vowel. Vowels gave her as much difficulty after six months as they had in the earliest sessions.

A. evidenced a "strategy" in the very first session which she was to maintain for the remaining 34 sessions with little modification. Three-quarters of all new CVC words presented to this child were "sounded-out" -- usually into the three component phonemes. It was clear that her sounding-out led to greater accuracy (70% of those words which were sounded-out were correct; less than 50% of those words which were not sounded-out were correct.) The sounding-out was a strong pattern which A. would abandon only when she was absolutely certain that she knew the stimulus word. When she did "know" the word, she sounded-out only half of the time. Her accuracy on both familiar and new words was the same when she sounded-out. However, when she did not sound-out, her accuracy on new words was poor (48%) by comparison with her accuracy on

familiar words (79%). It appeared that A. was willing to replace her overt sounding-out strategy with a more rapid and efficient recognition strategy on more familiar words. She did not attempt this new strategy to the same extent with unfamiliar words at any point in the sessions. During the course of the sessions, A.'s accuracy hardly increased in encoding (see Figure 1), although some improvement was evident in decoding.

In contrast with A., two of the other children evidenced striking improvement in both tasks. K., who was in the Whole-Word approach, improved considerably in his encoding, more so than in his decoding. M., who was also in the Whole-Word approach, showed a similar pattern of improvement. This was true even though they each began with extremely poor performance in both of the tasks. (It should be noted that A.'s performance may have been attenuated by ceiling effects. She did attain a similar level of accuracy by the final sessions.)

K.'s decoding errors generally involved either reversed responses (e.g., "time" for "mit") or substitutions for a particular component. M.'s decoding errors were often totally unrelated to the stimulus, or would include only one of the correct components. These patterns were somewhat reversed in encoding. M. produced assemblages of words which bore considerable resemblance to the stimulus word (e.g., psm for "pass"), while K. (at least initially) produced arrangements which were further removed from the stimulus (e.g., maa for "ris").

The evolution of a sounding-out strategy in both of these children was striking. After two-and-a-half months, K. sounded-out for the first time when decoding familiar words. He did this not because it facilitated his decoding, for he knew those words well. It was, rather, as if he was

using his knowledge of the whole word to test the accuracy of the sound-symbol correspondences which he had inferred. Once he discovered this procedure he began and continued to apply segmentation, but only in the encoding tasks. As a result, his encoding jumped to near-perfect accuracy on all new consonants (as well as on old ones). Prior to the emergence of segmentation, his encoding performance had been quite poor; it reached a peak of 67% error rate. Apparently, as additional material was introduced, K. found his rudimentary encoding strategies less and less adequate. We can speculate this his increasing error may have forced him to develop the new, more successful approach. In decoding, unlike in encoding, K. almost never overtly sounded-out new words. As a result, these words were responded to with less accuracy than were the encoding words.

M., the other child in the Whole-Word mode, also improved dramatically in his encoding. This was due, primarily, to his correct identification of at least one component in the stimulus, which he then correctly selected, often through the mediation of letter-naming. During a brief period of several weeks, he did overtly say the letter name and/or segment some of the components. Once the correct correspondences were established, however, he discontinued this practice (although he may have silently articulated the appropriate sounds).

As has been noted, both of these boys were more accurate in encoding than in decoding in the final sessions. They both developed effective encoding strategies (at least for CVC words) even though they had never been given any phono-graphemic information explicitly. K. achieved it by first, testing a sounding-out approach on "known" reading words, and then successfully transferring this procedure to the encoding of new

words. M. had a very short romance with overt segmentation, but this brief time appeared to be sufficient. Before the end of his sessions with us, he had an effective strategy which involved both occasional segmentation and/or letter-naming, as well as a procedure for identifying component sounds silently in order to select appropriate graphemes.

It is difficult to say why neither of these two children used an overt sounding-out strategy when confronted with new decoding words. Both boys, when tested on the screening test, did have fair to good blending and segmentation skills. Perhaps these children did not sound-out and blend new decoding words because in the Whole-Word approach, this was never implicitly required by the task, nor explicitly requested by the examiner.

As we presented the encoding task, in order to achieve accuracy, the children had to segment the spoken utterance -- regardless of instructional mode; there was no other way for them to identify the appropriate letters. Besides the implicit requirement to segment, encoding may be easier than decdoing because it does not impose so large a memory load. That is, unlike decoding, in encoding there is no need to hold the several sound equivalents in memory, since each sound can be encoded as soon as it is isolated and recognized. In addition, when encoding, the child already knows the content of what he or she is to assemble; that is, the idea prcedes the translation into symbols. In decoding however, the content is locked into the printed page and the child has the additional task of extracting the meaning.

The traditional educational viewpoint has been that encoding is a more difficult task for beginning readers than is decoding. Our results suggest that the opposite may be true, at least for some children, when confounding factors such as the use of pencil and paper are removed,

and replaced by the manipulation of pre-formed letters.

The strategies which evolved in the two tasks were not equally effective with vowels and consonants. Indeed, the children were consistently more accurate with consonants regardless of instructional mode and regardless of the level of accuracy achieved. This was true despite the fact that the children had to learn many more consonants than vowels. The differences in the final analysis period, when strategies were available to the children, were rather striking (see Figure 2). This concurs with the findings from other research (e.g., Coleman, 1970).

Although there is probably no one reason for the difficulty beginning readers have with vowels, at least two explanations are possible. While the names of English consonants tend to begin or end with the corresponding letter sound, the vowels have no such direct correspondence. The vowel names are the long vowel sound, and bear almost no relationship to the short vowel sound(s) of the letter. This lack of a cue in the manner of resemblance between letter name and short vowel sound may indeed account for some of the difficulties observed in using the short vowels.

In addition, the major part of the meaning of a word is often carried by the consonants; for this reason the consonants may be relatively more salient than the vowels. Especially for reading in context, knowledge of the consonants sounds, combined with semantic and syntactic cues, may often provide the child with sufficient information to "infer" the vowel sound and to thus postpone "learning" it. For example, KM's decoding accuracy was markedly superior when words were presented in context rather than in isolation. The errors she made in decoding

isolated words characteristically involved the vowel.

Context did not, however, enhance reading for all the children. Contextual clues were of little assistance to A., who tended to rely heavily on her sounding-out strategy and was seldom dissatisfied with the meaningless results (e.g., she read bill slid on the mat as "bill sild on the mat").

That some, but not all, beginning readers expect printed words to convey meaning not only when they appear in context but also when they stand alone seems clear from our study. Regardless of the meaningfulness of the word presented in isolation, the children did tend to respond with meaningful error responses, rather than nonsesne ones (see Figure 3 for an illustration of the nature of three children's error responses to meaningful decoding words). The apparent expectation to find meaning in new words may, of course, have been fostered by the preponderance of meaningful words in the curriculum.

Several directions for further research are indicated by the results of our study. First, for some children encoding may turn out to be an important route to reading, especially if pre-formed letters are provided. The relative ease of encoding may have been related to the requirements of the encoding task as we presented it. That is, when no process information is provided, it seems likely that the child will use a segmentation strategy.

The results presented here, and evidence from other research (e.g., Haddock, 1976), suggest that many children expect to extract meaning from the printed word. Consequently, they may feel constrained in their use of a nonsense response even when it is correct. The use of meaning for verification of their responses seems clearly desirable, except,

of course, when the stimulus is actually without meaning. Informing children that they are confronting a word which "doesn't make sense," would free them to respond with nonsense syllables, without looking for meaning as verification. They would thus be less apt to view such words as in violation of their expectations. The children would then continue to anticipate a meaningful result from their decoding efforts, unless specifically told otherwise. Further research is necessary to confirm this possibility.

Finally, the individual variations in strategy that emerged suggest that there are many routes to successful decoding and encoding, and that certain ones may be more appropriate for one child than for another. In addition, certain difficulties are commonly experienced, such as the treatment of "short" vowels. With a larger subject pool, the full range of patterns, as well as their relative frequency of occurrence, could be examined.

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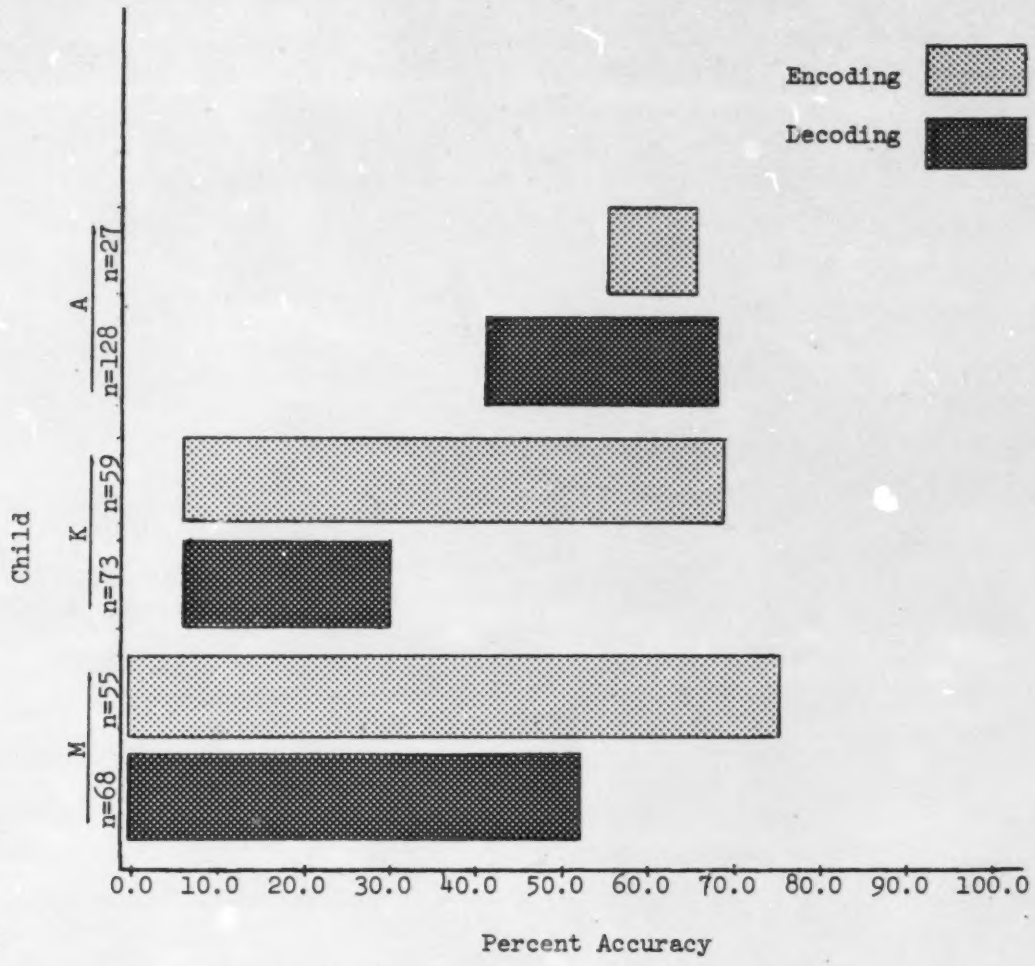


Note. Left boundary of each bar marks initial level of accuracy; right boundary of each bar marks final level of accuracy. The n for each bar represents the number of generalization words presented.

Figure 1. Improvement in accuracy of encoding and decoding tasks over time by three children (A, K, & M).

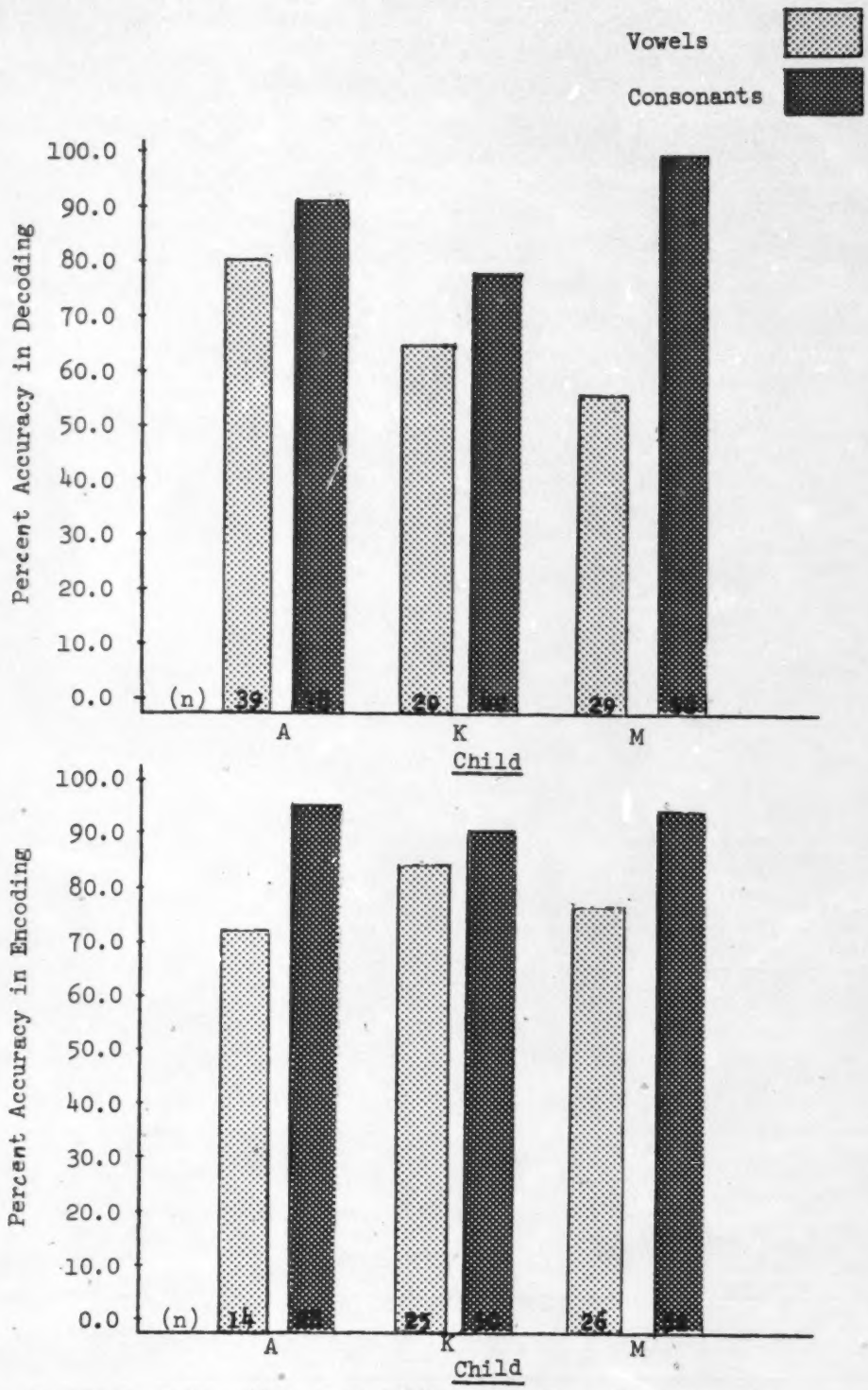
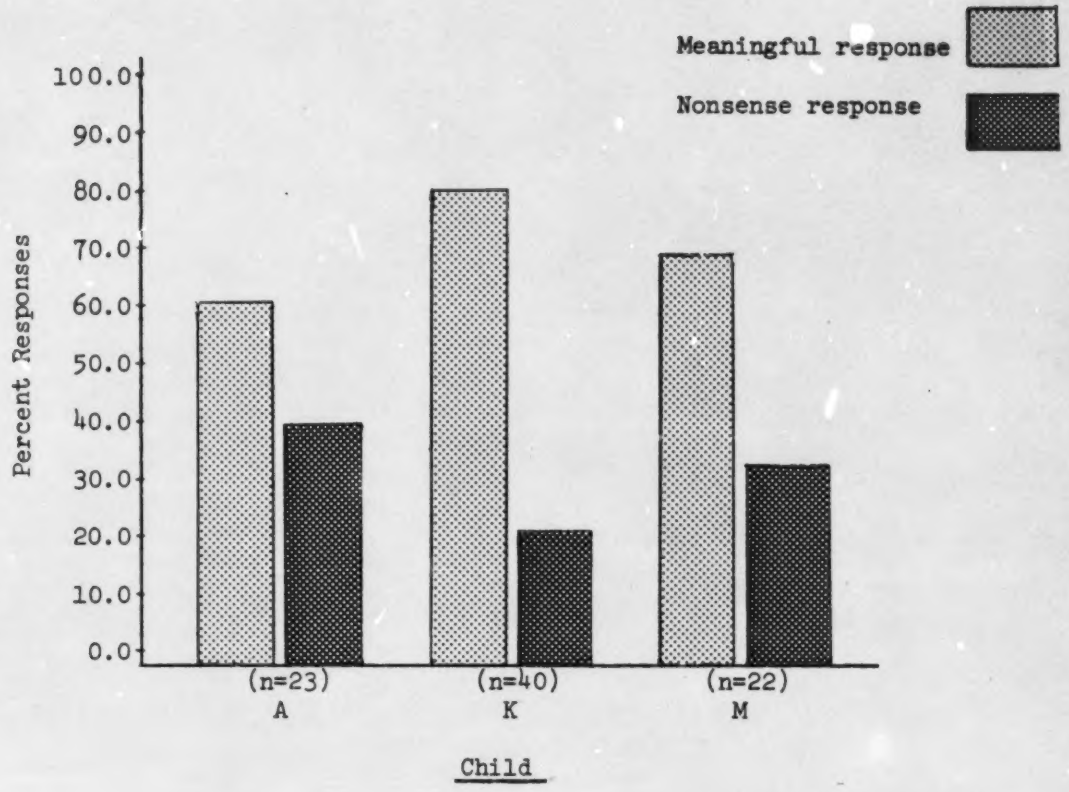


Figure 2. Accuracy of decoding and encoding vowels and consonants on the final analysis period of three children (A,K,&M).



Note. The n for each bar represents the number of meaningful decoding generalization words to which the child responded incorrectly.

Figure 3. Percentage of erroneous meaningful and nonsense decoding responses given by three children (A, K & M) to meaningful words.